

REMARKS

I. **CLAIM AMENDMENTS**

Claims 1, 5-8, 10-15 and 21-25 are pending in the present application.

Claim 1 is amended herein to remove two hydrophilic reaction layer elements, and to improve clarity.

Claims 5-8, 11 and 14 are amended herein to improve consistency with Claim 1 from which they depend.

Claim 21 is amended due to amendment of Claim 1 herein.

Claim 22 is amended due to amendment of Claim 1 and Claim 21.

Claims 24 and 25 are amended to depend from Claim 21 due to amendment of Claim 1 herein.

Thus, Applicant submits that the claim amendments do not introduce new matter.

II. **STATEMENT REGARDING SUBSTANCE OF INTERVIEW**

Applicant appreciates the courtesy shown by Examiner in granting a telephonic interview on 13 April 2011. In response to the Interview Summary dated 19 April 2011, the following statement regarding the substance of the interview is respectfully submitted.

During the interview, Applicant requested the Examiner clarify the rejections and point out specific support for the allegation that the applied art discloses a hydrogel that is “internally cross-linked” by a cross-linking agent.

THE REMAINDER OF THE PAGE HAS BEEN LEFT BLANK INTENTIONALLY

RESPONSE TO OFFICE ACTION DATED 2 DECEMBER 2010

1. Rejection under 35 U.S.C. §103(a) over Albers and Johnson

Claims 1, 5-6, 8, 10-15, 21 and 24-25 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over U.S. Patent No. 7,208,077 to Albers, *et al.* ("Albers") in view of U.S. Patent No. 6,372,813 to Johnson, *et al.* ("Johnson"). This rejection is respectfully traversed.

Claim 1 as amended herein recites:

A DNA chip, comprising:
a flat carrier; and

an array of spots containing catcher molecules, each spot being assigned a microelectrode arrangement for detecting binding events between the catcher molecules and target molecules applied via an analyte solution, the microelectrode arrangement being at least partially embedded in a hydrophilic reaction layer which is permeable to target molecules and in which immobilized catcher molecules are distributed three-dimensionally,

the hydrophilic reaction layer having a thickness approximately in the range of $1L$ to $5L$, L being the sum of electrode width and electrode spacing, the electrode width and the electrode spacing being approximately $1\mu\text{m}$.

Applicant respectfully submits that the Office has not established a presumption of *prima facie* obviousness for Claim 1 nor any of the claims depending therefrom for at least the following reasons.

A. No rationale is presented for how an ordinary artisan would have a reasonable expectation of success to arrive at Claim 1

At the outset, the Office maintains on pg. 11 of the 2 Dec 2010 Office Action that it "would have been *prima facie* obvious to one having ordinary skill in the art...to modify the hydrogel layer of Albers *et al* with the hydrogel layer of varying thickness of Johnson *et al* with a reasonable expectation of success." There is no explanation presented in the 2 Dec 2010 Office Action of why there would be a reasonable expectation of success. Applicant respectfully reminds the Office that "rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006), cited with approval in *KSR v. Teleflex*, 127 S.Ct. 1727, 82 USPQ2d 1385 (2007).

Thus, for at least this reason, a presumption of *prima facie* obviousness has not been established for Claim 1 over Albers and Johnson.

B. The cited art does not teach or suggest the link between reaction layer thickness and electrode dimensions as recited in Claim 1

Claim 1 recites “the hydrophilic reaction layer having a thickness approximately in the range of $1L$ to $5L$, L being the sum of electrode width and electrode spacing, the electrode width and the electrode spacing being approximately $1\mu\text{m}$.” Thus, the reaction layer thickness is necessarily linked or correlated to the electrode dimensions. This structural element of Claim 1 is not discussed in the present Office Action, nor is this claimed link taught or suggested in Albers or Johnson.

The Office has already admitted that Albers does not teach gel thickness. Therefore, necessarily, Albers does not teach or suggest the linkage between the reaction layer thickness and electrode dimensions. Further, the Office relies on Johnson for teaching a reaction layer thickness between about $1\mu\text{m}$ to about $40\mu\text{m}$, at Col. 5. However, more importantly, Johnson does not even teach a DNA chip with electrodes, let alone teach or suggest any linkage between electrode dimensions and the thickness of the reaction layer as recited in pending Claim 1. A claim must be viewed “as a whole”, including how the structural elements of the claim interact with each other. It was recently stated in *KSR, supra* that “the determination of obviousness is made with respect to the subject matter as a whole, not separate pieces of the claim.” It was Applicant who first discovered the claimed linkage or correlation between reaction layer thickness and the electrode dimensions. As stated on p. 4 of Applicant’s specification as filed, the link between reaction layer thickness and the electrode dimensions “ensures that, on the one hand, a region of the electric field with a relatively high field line density is utilized for detecting binding events and, on the other hand, the thickness of the reaction layer is not so large that it impedes the indiffusion of target molecules and reactants.” There is no mention of the claimed linkage or these concepts in the cited art. Therefore, the cited art provides no guidance toward Claim 1.

Thus, for at least this further reason, a presumption of *prima facie* obviousness has not been established for Claim 1 over Albers and Johnson.

C. No motivation to modify the cited art to arrive at Claim 1

The Office asserts that an “ordinary artisan would have been motivated to modify the hydrogel layer of Albers et al with the expected benefit of having a [*sic*] hydrogel pads that

are easy to produce, economical, which reduces the biochip manufacturing cost, enhances the throughput and performing cross-linking of the hydrogel and attachment of biomolecules in a single step as taught by Johnson et al (column 3, lines 19-25 and 37-44).” See 2 Dec 2010 Office Action, pg. 11.

Applicant submits that (1) the asserted motivation is deficient, and (2) in any event, there is no motivation to modify the cited art to arrive at pending Claim 1. The above asserted rationale attempts to answer the question, why would the ordinary artisan be motivated to modify the hydrogel layer of Albers? This question and the asserted rationale are deficient because the present invention is not merely a modification of thickness of the hydrogel layer, but, as stated above, a linkage between the thickness of the reaction layer and the electrode dimensions. Thus, simply providing a motivation to modify thickness does not amount to a motivation to provide a link between reaction layer thickness and electrode dimensions, as recited in Claim 1.

Moreover, the Office states that the reason the ordinary artisan would be motivated to modify the hydrogel layer is because of “an expected benefit of hydrogel pads, such as economic cost”. How does any “expected” benefit of hydrogel pads, such as economic cost, provide motivation to the ordinary artisan to link reaction layer thickness with electrode dimensions? Johnson does not even state what part of their invention leads to such economic benefit at column 3. Furthermore, and more relevant to the analysis of Claim 1, neither Albers nor Johnson teaches that if one links reaction layer thickness with electrode dimensions that this will help with economic cost and throughput. As stated above, neither Albers nor Johnson even mentions this topic. Thus, the cited documents provide no motivation to modify Albers to arrive at Claim 1.

Thus, for at least this further reason, a presumption of *prima facie* obviousness has not been established for Claim 1 over Albers and Johnson.

Claims 5-6, 8, 10-15, 21 and 24-25 each embody all the limitations of Claim 1 from which it directly or ultimately depends, and are therefore nonobvious for at least the same reasons that Claim 1 is nonobvious. If an independent claim is nonobvious under 35 U.S.C. §103, then any claim depending therefrom is nonobvious. See MPEP 2143.03.

Reconsideration and withdrawal of the present rejection is respectfully requested.

2. Rejection under 35 U.S.C. §103(a) over Albers, Johnson and Valint

Claim 7 stands rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Albers in view Johnson, and in further view of U.S. Publication No. 2002/0102415 (“Valint”). This rejection is respectfully traversed.

Claim 7 recites “The DNA chip as claimed in claim 1, wherein the reaction layer is thermally stable up to approximately 95°C.”

The Office acknowledges that Albers and Johnson do not teach the thermal stability of the reaction layer. *See* 2 Dec 2010 Office Action, pg. 11. Therefore, the Office relies on Valint for allegedly teaching “that the hydrogel polymer layer is resistant to heat up to 90°C..., which encompasses reaction layer thermally stable [*sic*] up to approximately 95°C.”

First, Claim 7 depends from Claim 1. Valint does not cure any of the deficiencies of Albers and Johnson that are discussed in Sec. 1 of this response. For example, neither Albers, Johnson nor Valint provides any teaching or suggestion regarding the claimed link or correlation between reaction layer thickness and electrode dimensions. For at least this reason, a presumption of *prima facie* obviousness has not been established for Claim 7 over the cited art.

Second, the Office merely states that “it would have been *prima facie* obvious to one of ordinary skill in the art...to modify the hydrogel of Albers et al with the thermally stable hydrogel of Valint et al with a reasonable expectation of success.” *See* 2 Dec. 2010 Office Action, pg. 12. Again, there is no explanation in the Office Action of why there would be a reasonable expectation of success. As noted in Sec. 1, a rationale must be presented to establish a presumption of *prima facie* obviousness. Thus, for at least this further reason, a presumption of *prima facie* obviousness has not been established for Claim 7 over the cited art.

Third, regarding a motivation to modify Albers, the Office asserts “[a]n artisan would have been motivated to modify the hydrogel of Albers et al and Johnson et al with the expected benefit of sterilizing hydrogel and still retaining its property as taught by Valint et al (paragraph 0152)” *See* 2 Dec 2010 Office Action, pg. 12. The proposed “expected benefits” that would allegedly motivate an ordinary artisan to arrive at Claim 7 from Valint do not relate to a hydrogel layer on a DNA microchip. Valint does not teach a DNA microchip with hydrogel with the thermal stability. Instead, Valint reports XPS analysis of contact lenses at 90°C. There is no teaching about structure or bioactivity of a gel layer. Thus, the proposed rationale fails to establish a motivation to arrive at a DNA chip as claimed in Claim 1 and

having the thermal stability as claimed in Claim 7. Thus, for at least this further reason, a presumption of *prima facie* obviousness has not been established for Claim 7 over the cited art.

Reconsideration and withdrawal of the present rejection is respectfully requested.

3. Rejection under 35 U.S.C. §103(a) over Albers, Johnson and Mansouri

Claims 22 and 23 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Albers in view Johnson, and in further view of U.S. Publication No. 2003/0000833 ("Mansouri"). This rejection is respectfully traversed.

Claims 22 and 23 depend from Claim 1. Albers and Johnson are cited for their disclosures as summarized above. Mansouri is cited for tetraethylene glycol dimethylacrylate as a cross-linking agent, which is a specified component only in Claim 23. However, Mansouri provides no teaching or suggestion that corrects the deficiencies of Albers and Johnson set forth above in Sec. 1 of this response for Claim 1. In particular, no teaching or suggestion can be found in Mansouri that would motivate a person of ordinary skill to link or correlate reaction layer thickness and electrode dimensions in a DNA chip. Thus, for at least this reason, a presumption of *prima facie* obviousness has not been established for Claims 22 and 23 over the cited art.

Moreover, again, there is no explanation of why there would be a reasonable expectation of success on pg. 14 of the 2 Dec 2010 Office Action.

Reconsideration and withdrawal of the present rejection is respectfully requested.

4. Conclusion

It is believed that all of the stated grounds of rejection are properly traversed, accommodated, or rendered moot herein. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the present Office Action and that the application is in condition for allowance.

Should any issues remain, the Examiner is invited to call the undersigned at the telephone number given below.

Respectfully submitted,

HARNES, DICKEY & PIERCE, P.L.C.

/ Leanne M. Rakers /

Leanne M. Rakers
Attorney for Applicant
Reg. No. 64,412
Harness, Dickey & Pierce, P.L.C.
7700 Bonhomme, Suite 400
St. Louis, Missouri 63105
314.726.7514 (direct)
314.726.7501 (fax)